ASSIGNMENT 3

Textbook Assignment: "Transmission Lines and Waveguides," chapter 3, pages 3-1 through 3-32.

3-1. A transmission line is designed to perform which of the following functions?

1. Disperse energy in all directions
2. Detune a transmitter to match the load
3. Guide electrical energy from point to point
4. Replace the antenna in a communications system

3-2. The conductance value of a transmission line represents which of the following values?

1. Expected value of current flow through the insulation
2. Expected value of voltage supplied by the transmitter
3. Value of the lump and distributed constants of the line divided by impedance
4. Value of the lumped constants of the line as seen by the source and the load

3-3. Distributed constants in a transmission line are distributed in which of the following ways?

1. Between ground and any single point on the line
2. Along the length of the line
3. According to the thickness of the line
4. According to the cross-sectional area of the line

3-4. Leakage current in a two–wire transmission line is the current that flows through what component?

1. The resistor
2. The inductor
3. The insulator
4. The conductor

3-5. Conductance is the reciprocal of what electrical property?

1. Inductance
2. Resistance
3. Capacitance
4. Reciprocity

3-6. A transmission line that has current flowing through it has which of the following fields about it?

1. Electric only
2. Magnetic only
3. Both electric and magnetic
4. Capacitive

3-7. A measurement of the voltage to current ratio (E_{in}/I_{out}) at the input end of a transmission line is called the

1. input–gain rate
2. voltage–gain ratio
3. output impedance
4. input impedance

3-8. The characteristic impedance (2.) of a transmission line is calculated by using which of the following ratios?

1. R_{source} to R_{load} of the line
2. I_{max} to I_{min} at every point along the line
3. E to I at every point along the line
4. E_{in} to E_{out} of the line

3-9. Maximum transfer of energy from the source to the transmission line takes place when what impedance relationship exists between the source and the transmission line?

1. When the load impedance equals the source impedance
2. When the load impedance is twice the source impedance
3. When the load impedance is half the source impedance
4. When the load impedance is one-fourth the source impedance

3-10. Which of the following sets of terms represents a type of loss in a transmission line?

1. I^2R and induction only
2. Induction and dielectric only
3. Dielectric and radiation only
4. I^2R, induction, and dielectric

3-11. Skin effect is classified as which of the following types of loss?

1. Copper
2. Voltage
3. Induction
4. Dielectric

3-12. What transmission-line loss is caused by magnetic lines of force not returning to the conductor?

1. Copper
2. Radiation
3. Induction
4. Dielectric

3-13. When a dc voltage is applied to a transmission line and the load absorbs all the energy, what is the resulting relationship between current and voltage?

1. They are in phase with each other
2. They are equal to Z_0 of the line
3. They are out of phase with each other
4. They are evenly distributed along the line

3-14. The initial waves that travel from the generator to the load of a transmission line are referred to as what type of waves?

1. Incident
2. Refracted
3. Reflected
4. Diffracted

3-15. Waves that travel from the output end to the input end of a transmission line are referred to as what type of waves?

1. Incident
2. Refracted
3. Reflected
4. Diffracted

3-16. The ratio of maximum voltage to minimum voltage on a transmission line is referred to as the

1. rswr
2. pswr
3. vswr
4. iswr

3-17. Which of the following ratios samples the magnetic field along a line?

1. Vswr
2. Pswr
3. Iswr
4. Rswr

3-18. Which of the following lines is NOT a transmission medium?

1. Load line
2. Coaxial line
3. Two-wire open line
4. Twisted-pair line

3-19. Electrical power lines are most often made of which of the following types of transmission lines?

1. Twin-lead line
2. Shielded-pair line
3. Two–wire open line
4. Two–wire ribbon line

3-20. Uniform capacitance throughout the length of the line is an advantage of which of the following transmission lines?

1. Coaxial line
2. Twisted pair
3. Shielded pair
4. Two-wire open line

3-21. What is the primary advantage of a rigid coaxial line?

1. Low radiation losses
2. Inexpensive construction
3. Low high–frequency losses
4. Easy maintenance

3-22. The most efficient transfer of electromagnetic energy can be provided by which of the following mediums?

1. Waveguides
2. Twin–lead flat lines
3. Single-conductor lines
4. Coaxial transmission lines

3-23. Copper I^2R losses are reduced by what physical property of waveguides?

1. Small surface area
2. Large surface area
3. Shape of the waveguides
4. Waveguide material being used

3-24. In a coaxial line, the current-carrying area of the inner conductor is restricted to a small surface layer because of which of the following properties?

1. Skin effect
2. Copper loss
3. Conductor density
4. Waveguide material being used

3-25. Which of the following dielectrics is used in waveguides?

1. Air
2. Mica
3. Insulating oil
4. Insulating foam

3-26. Which of the following characteristics of a waveguide cause its lower–frequency limitation?

1. I^2R loss
2. Physical size
3. Wall thickness
4. Dielectric loss

3-27. At very high frequencies, ordinary insulators in a two-wire transmission line display the characteristics of what electrical component?

1. An inductor
2. A resistor
3. A capacitor
4. A transformer

3-28. At high frequencies, which of the following devices works best as an insulator?

1. An open half-wave section
2. An open quarter–wave section
3. A shorted half–wave section
4. A shorted quarter-wave section

3-29. The range of operating frequencies is determined by which of the following waveguide dimensions?

1. The widest (height/width)
2. The narrowest (height/ width)
3. The shortest (length)
4. The longest (length)

3–30. The cutoff frequency for a waveguide is controlled by the physical dimensions of the waveguide and is defined as the frequency at which two quarter wavelengths are

1. shorter than the “a” dimension
2. shorter than the “b” dimension
3. longer than the “a” dimension
4. longer than the “b” dimension

3-31. In practical applications, which of the following dimensions describes the wide dimension of the waveguide at the operating frequency?

1. 0.1 wavelength
2. 0.2 wavelength
3. 0.5 wavelength
4. 0.7 wavelength

3-32. Which of the following fields is/are present in waveguides?

1. E field only
2. H field only
3. E and H fields
4. Stationary fields

3-33. A difference in potential across a dielectric causes which of the following fields to develop?

1. Electric only
2. Magnetic only
3. Electromagnetic

3-34. H lines have which of the following distinctive characteristics?

1. They are continuous straight lines
2. They are generated by voltage
3. They form closed loops
4. They form only in the waveguide

3-35. For an electric field to exist at the surface of a conductor, the field must have what angular relationship to the conductor?

1. 0°
2. 30°
3. 45°
4. 90°

3-36. If the wall of a waveguide is perfectly flat, the angle of reflection is equal to which of the following angles?

1. Cutoff
2. Incidence
3. Refraction
4. Penetration

3-37. The cutoff frequency in a waveguide occurs at exactly what angle of reflection?

1. 10°
2. 30°
3. 45°
4. 90°

3–38. How does the group velocity of an electromagnetic field in a waveguide compare to the velocity of a wavefront through free space?

1. Group velocity is somewhat faster
2. Group velocity is somewhat slower
3. Group velocity is twice that of free velocity
4. Free velocity is twice that of group velocity

3-39. The group velocity of a wavefront in a waveguide may be increased by which of the following actions?

1. Decreasing the frequency of the input energy
2. Increasing the frequency of the input energy
3. Increasing the power of the input energy
4. Decreasing the power of the input energy

3–40. The various field configura–tions that can exist in a waveguide are referred to as

1. wavefronts
2. modes of operation
3. fields of operation
4. fields of distribution

3-41. The most efficient transfer of energy occurs in a waveguide in what mode?

1. Sine
2. Dominant
3. Transverse
4. Time–phase

3-42. How is the cutoff wavelength for a circular waveguide computed?

1. 1.17 times the radius of the waveguide
2. 1.17 times the diameter of the waveguide
3. 1.71 times the diameter of the waveguide
4. 1.71 times the radius of the waveguide

3-43. The field configuration in waveguides is divided into what two categories?

1. Half-sine and dominant
2. Transverse electric and transverse magnetic
3. Transverse electric and dominant
4. Transverse magnetic and half-sine

3-44. With a mode description of $TE_{1,0}$, what maximum number of half-wave patterns exist across the "a" dimension of a waveguide?

1. One
2. Two
3. Three
4. Four

3–45. With the mode description, $TE_{1,1}$, what maximum number of half-wave patterns exist across the diameter of a circular waveguide?

1. One
2. Two
3. Three
4. Four

3-46. Which of the following devices CANNOT be used to inject or remove energy from a waveguide?

1. A slot
2. A loop
3. A probe
4. A horn

3-47. Loose coupling is a method used to reduce the amount of energy being transferred from a waveguide. How is loose coupling achieved when using a probe?

1. By doubling the size of the probe
2. By increasing the length of the probe
3. By decreasing the length of the probe
4. By placing the probe directly in the center of the energy field

3-48. Increasing the size of the loop wire increases which of the following loop capabilities?

1. Efficiency
2. Bandwidth coverage
3. Power–handling capability
4. Each of the above

3-49. A waveguide that is not perfectly impedance matched to its load is not efficient. Which of the following conditions in a waveguide causes this inefficiency?

1. Sine waves
2. Dominant waves
3. Standing waves
4. Transverse waves

3-50. A waveguide iris that covers part of both the electric and magnetic planes acts as what type of equivalent circuit at the resonant frequency?

1. As an inductive reactance
2. As a shunt resistance
3. As a capacitive reactance
4. As a shorted 1/4 wave stub

3-51. A horn can be used as a waveguide termination device because it provides which of the following electrical functions?

1. A reflective load
2. An absorptive load
3. An abrupt change in impedance
4. A gradual change in impedance

3-52. For a waveguide to be terminated with a resistive load, that load must be matched to which of the following properties of the waveguide?

1. The bandwidth
2. The frequency
3. The inductance
4. The characteristic impedance

3-53. A resistive device with the sole purpose of absorbing all the energy in a waveguide without causing reflections is a/an

1. iris
2. horn
3. antenna
4. dummy load

3-54. A resistive load most often dissipates energy in which of the following forms?

1. Heat
2. Light
3. Magnetic
4. Electrical

3-55. Reflections will be caused by an abrupt change in which of the following waveguide's physical characteristics?

1. Size and shape only
2. Size and dielectric material only
3. Dielectric material and shape only
4. Size, shape, and dielectric material

3-56. A waveguide bend that in the E and H plane must be greater than two wavelengths to prevent

1. cracking
2. reflections
3. energy gaps
4. electrolysis

3-57. A flexible waveguide is used in short sections because of the power-loss disadvantages. What is the cause of this power loss?

1. Walls are not smooth
2. E and H fields are not perpendicular
3. Cannot be terminated in its characteristic impedance
4. Wall size cannot be kept consistent

3-58. The choke joint is used for what purpose in a waveguide?

1. To reduce standing waves
2. To restrict the volume of electron flow
3. To prevent the field from rotating
4. To provide a joint that can be disassembled during maintenance

3-59. A circular waveguide is normally used in a rotating joint because rotating a rectangular waveguide would cause which of the following unwanted conditions?

1. Oscillation
2. Large power loss
3. Decrease in bandwidth
4. Field–pattern distortion

3-60. In your waveguide inspection, you should be alert for which of the following problems?

1. Corrosion
2. Damaged surfaces
3. Improperly sealed joints
4. Each of the above

3–61. What type of corrosion occurs when dissimilar metals are in contact with each other?

1. Contact
2. Metallic
3. Electrical
4. Electrolytic

3–62. Internal arcing in a waveguide is usually a symptom of which of the following conditions?

1. Change in mode
2. Electrolysis at a joint
3. Moisture in the waveguide
4. Gradual change in frequency

3-63. What is the primary purpose of a directional coupler?

1. To sample the energy in a waveguide
2. To change the phase of the energy in the waveguide
3. To change the direction of energy travel in the waveguide
4. To allow energy in the waveguide to travel in one direction only

3-64. What is the electrical distance between the two holes in a simple directional coupler?

1. 1/8 wavelength
2. 1/4 wavelength
3. 1/2 wavelength
4. 3/4 wavelength

3-65. Of the following characteristics, which is NOT required for a device to be considered a resonant cavity?

1. Be enclosed by conducting walls
2. Possess resonant properties
3. Contain oscillating electromagnetic fields
4. Be round or elliptical in shape

3-66. What property gives a resonant cavity a narrow bandpass and allows very accurate tuning?

1. Low Q
2. High Q
3. Inductive reactance
4. Capacitive reactance

3-67. What factor(s) determine(s) the primary frequency of a resonant cavity?

1. Size only
2. Shape only
3. Size and shape
4. Q of the cavity

3-68. Tuning is the process of changing what property of a resonant cavity?

1. The Q
2. The power
3. The cutoff frequency
4. The resonant frequency

3-69. What are the two basic types of waveguide T junctions?

1. H and T
2. H and E
3. Hybrid Ring and magic T
4. Q and magic T

3-70. A waveguide junction in which the arm area extends from the main waveguide in the same direction as the electric field is an example of what type junction?

1. E–type T
2. H-type T
3. H-type T junction
4. H–type junction

3-71. Low power handling capabilities and internal power losses are the primary disadvantages of which of the following junctions?

1. Magic T
2. Rat race
3. Duplexer
4. Hybrid ring

3-72. The hybrid ring is usually used as what type of device in radar systems?

1. Mixer
2. Detector
3. Duplexer
4. Impedance matcher

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